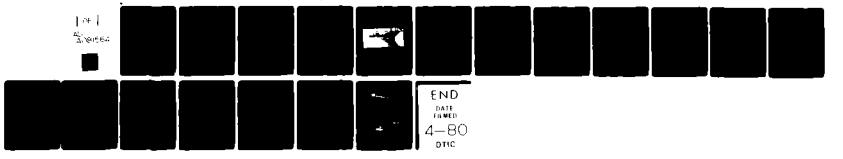
AD-A081 564 ADMIRALTY EXPERIMENT WORKS HASLAR (ENGLAND) F/G 13/10
SEA KNIFE ANALYSIS OF SELECTED SEAKEEPING DATA. VOLUME 1.(U)
NOV 76 M A HAMMOND, K NICHOLSON N68171-76-V-9910
UNCLASSIFIED AEW-TR-N76034-VOL-1 NL



END
DATE FILMED
4-80
DTIC

UNCLASSIFIED

AEW TR N76034
Copy No 1

AEW

SEA KNIFE
ANALYSIS OF SELECTED SEAKEEPING DATA
VOLUME 1 [U]

M A Hammond

K Nicholson

ADMIRALTY EXPERIMENT WORKS
HASLAR GOSPORT
HAMPSHIRE PO 12 2AG

PROCUREMENT EXECUTIVE
MINISTRY OF DEFENCE

AEW TR N76034

UNCLASSIFIED November 1976

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING
1. REPORT NUMBER AEW TR NT6034	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Sea Knife - Analysis of Selected Seakeeping Data Vol. I (U)		5. TYPE OF REPORT & PERIOD COVERED 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) M. A. Hammond K. Nicholson		8. CONTRACT OR GRANT NUMBER(s) Payne, Inc. N00014-75-C-0926 P00005
9. PERFORMING ORGANIZATION NAME AND ADDRESS Admiralty Experiment Works Hampshire PO 12 2 AG England		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS		12. REPORT DATE 13. NUMBER OF PAGES Vol. I-17 Vol. II-115
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office) DTNSRDC Bethesda, Maryland 20084		15. SECURITY CLASS. (of this report) Unclassified 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Unlimited and approved for Public release.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Vol. I Report
Vol. II Figures

This report used by OP96V in their study: Advanced Naval Vehicle Concepts Evaluation.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Advanced Naval Vehicle Concepts Evaluation
ANVCE
Technology Assessment
Sea Knife
Seakeeping Data (Selected)
Planing Ship

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report presents the results of spectral analysis on a selection of seakeeping tests carried out on a 1/16 full size model of SEA KNIFE. SEA KNIFE is an experimental planing hull design.

DD FORM 1473 EDITION OF 1 NOV 65 IS OBSOLETE

ADMIRALTY EXPERIMENT WORKS, HASLAR

(9) AEW TECHNICAL REPORT N76034

(14) AEW-TR-N7604-V.1-1

(6) SEA KNIFE

ANALYSIS OF SELECTED SEAKEEPING DATA. Volume 1.

(U)

(15) N.S.M.I-'3-I-9711

BY

M A HAMMOND
K NICHOLSON

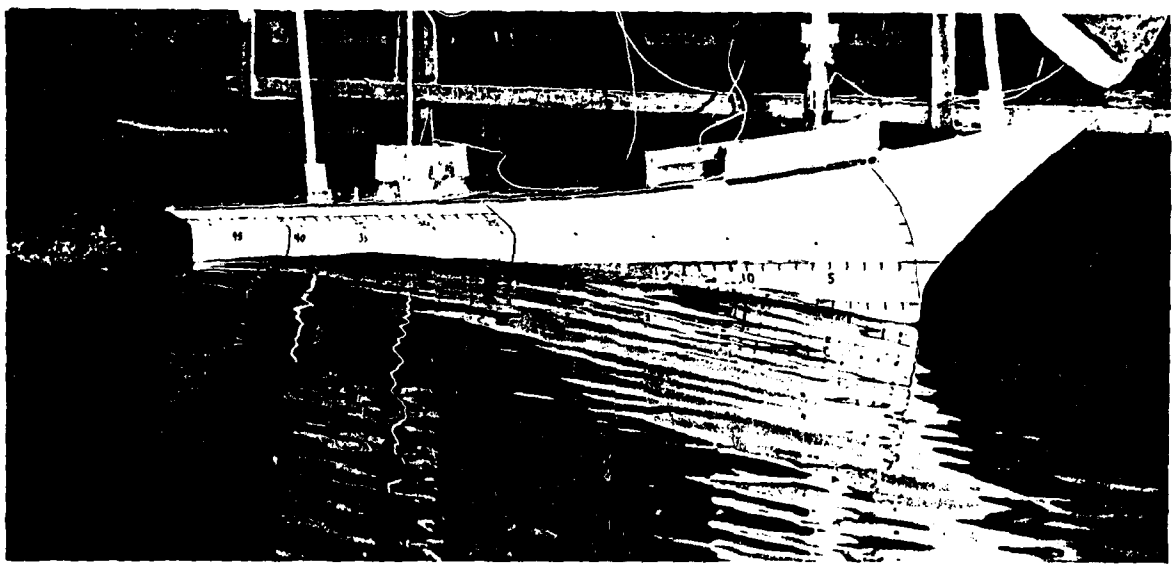
(11) NOV[redacted]976

(12) 18

A

PROCUREMENT EXECUTIVE
MINISTRY OF DEFENCE

04



Contents

Volume 1

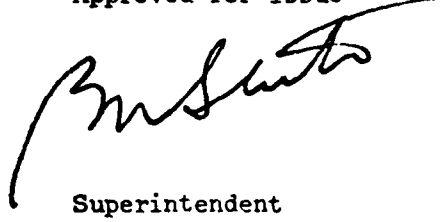
Volume 2 - Spectra

Summary

1. This Report presents the results of spectral analysis on a selection of seakeeping tests carried out on a $^{1}/_{16}$ full size model of SEA KNIFE in No 1 Ship Tank.

2. The work was undertaken on behalf of DTNSRDC under contract number N68171-76-V-9910, and formed part of the US Navy Project on Advance Naval Vehicle Concept Evaluations.

Approved for issue



Superintendent

SEA KNIFE
ANALYSIS OF SELECTED SEAKEEPING DATA

By M A Hammond
K Nicholson

1. INTRODUCTION

Resistance and seakeeping tests were conducted in No 1 Ship Tank during May 1976 on a $^1/_{16}$ full-scale model of SEA KNIFE.

The purpose of the project, the model configurations, calm water resistance data and experimental arrangements were reported in Reference 1.

AEW was subsequently requested by DTNSRDC to analyse a selection of the data from the seakeeping tests on a repayment basis under contract number N68171-76-V-9910.

This Report presents the results of the requested seakeeping analysis.

2. DESCRIPTION

Photographs of the two model configurations are shown in Figures 1 and 2 respectively, whilst model and ship particulars are given in Table 1 and the irregular seas test programme is summarised in Table 2. Table 3 lists the measured parameters, their ranges and the media on which they were recorded.

This Report contains the results of spectral analysis for the 26 runs selected by DTNSRDC using an adaption of the auto-correlation method outlined in Reference 2.

The resistance in waves was recorded only on ultraviolet paper and a mean level has been determined by averaging peaks and troughs. An estimate of the calm water resistance has been made for the appropriate conditions from measured data and the added resistance deduced as the difference between the two values. No value is available for run 878 as the trace was unreadable.

Certain of the magnetic tape records were unsuitable for computer analysis for a variety of reasons including their short duration and high noise to signal ratios. Root mean square (rms) values have been calculated from the downstream ultraviolet records for these cases and the appropriate values are indicated in Tables 4-6 by an asterisk (*)

No value of heave was recorded on runs 898, 899, 908 and 909.

3. RESULTS

The analysed data for configuration 1 in sea state 3 are in Table 4 and the associated spectra are presented in Figures 3-35. Results for configuration 1 in sea state 5 are given in Table 5 and Figures 36-73, whilst the results of configuration 2 tests in sea state 3 are shown in Table 6 and Figures 74-114.

Figures 3 to 114 are contained in Volume 2 of this report.

References

Reference 1. AEW-TM-76027. SEA KNIFE Calm Water Resistance Experiments (U). By G W Robson. July 1976. COMMERICAL IN CONFIDENCE.

Reference 2. Theory of Seakeeping. By B V Korvin-Kroukovsky. SNAME 1961.

Table 1

MODEL AND SHIP PARTICULARS

(α = 17.5 Degrees Hard Chine Bottom No Spray Reversers)

	Model	Ship
L_{OA} metres (ft)	1.497 (4.91)	23.952 (78.6)
L_{WL} metres (ft)	1.259 (4.13)	20.144 (66.1)
L_{PP} metres (ft)	1.219 (4.00)	19.504 (64.0)
L_{K} metres (ft)	1.036 (3.40)	16.576 (54.4)
B (at WL without spray reversers) metres (ft)	0.390 (1.28)	6.240 (20.5)
B (max at deck) metres (ft)	0.591 (1.94)	9.456 (31.0)
T (standard condition) metres (ft)	0.069 (0.227)	1.104 (3.6)
T (heavy condition) metres (ft)	0.081 (0.267)	1.296 (4.3)
Mass (standard condition) kg (lb)	12.950 (28.55)	54430 (120,000)
Mass (heavy condition) kg (lb)	16.175 (35.66)	68040 (150,000)

Table 2

TEST PROGRAMME

Irregular Head Sea Experiments		
Test 15	Configuration 1 Prototype speeds, 5, 14, 20, 30, 40, 45 knots State 3 and state 5	Standard condition
Test 16	Configuration 1 Speeds as above State 3 only	Heavy condition
Test 17	Configuration 2 Speeds as above State 3 only	Standard condition
Tests 1-11	Were conducted at US Naval Academy	
Tests 12-14	Were calm water resistance experiments at AEW	

Table 3

MEASURED PARAMETER RANGE AND RECORDING MEDIA

Parameter	Range	Medium
Pitch	± 9 degrees	Digital magnetic tape (DMT)
Heave (at CG)	± 7 cms	DMT
Vertical acceleration at CG	5 g	DMT
Vertical acceleration at bow	5 g	DMT
Encountered wave height	± 22 cms	DMT
Towing force	400 Newtons	Ultraviolet recorder

Table 4

RESULTS FOR HARD CHINE MODEL (CONFIGURATION 1) IN SEA STATE 3

Run No	AEW Star Run No	Model Speed (m/s)	Trim Flap Angle (Degs)	Rms					Figure No	Mean Resistance (Newtons)	Deduced	
				Pitch (Degs)	Heave (CM)	CG Accel (G)	Bow Accel (G)	Wave (CM)			Calm Resistance (N)	Resistance Increase (N)
15/2	878	1.820	20	2.13	1.893	0.176	0.235	1.521	3-7	-	-	-
15/3	879	3.883	4	0.795	1.078	0.140	0.198	1.073	8-12	35.14	27.58	7.56
15/7	883	3.854	4	1.136	1.686	0.232	0.244	2.256*	13-16	33.81	27.58	6.23
15/8	884	3.901	4	1.135	1.556	0.234	0.236	1.55	17-21	32.92	27.58	5.34
15/12	888	5.78	2.5	1.164*	2.418*	0.379*	0.664*	2.59*	-	64.05	44.93	19.12
15/13	889	5.771	2.5	0.813	1.31	0.34	0.357	2.068	22-26	68.46	44.48	23.98
15/14	890	5.808	2.5	0.73	1.241	0.305	0.291	1.634	27-31	64.14	44.48	19.66
15/15	891	5.809	2.5	1.212*	1.338	0.331	0.301	1.747	32-35	64.28	44.48	19.80

Table 5

RESULTS FOR HARD CHINE MODEL (CONFIGURATION 1) IN SEA STATE 5

Run No	AEW Star Run No	Model Speed (m/s)	Trim Flap Angle (Degs)	Rms					Figure No	Mean Resistance (Newtons)	Deduced	
				Pitch (Degs)	Heave (CM)	CG Accel (G)	Bow Accel (G)	Wave (CM)			Calm Resistance (N)	Resistance Increase (N)
15/17	893	1.804	20	3.623	5.545*	0.300	0.368	3.163	36-39	20.02	16.9	3.12
15/18	894	1.805	20	3.462	3.967	0.326	0.376	3.179	40-44	19.57	16.9	2.67
15/19	896	3.859	4	2.42	3.289	0.423	0.447	2.961	45-49	36.92	27.58	9.34
15/20	897	3.864	4	1.812	2.963	0.377	0.393	2.709	50-54	37.36	27.58	9.78
15/21	898	3.866	4	1.789	-	0.302	0.306	2.488	55-58	35.59	27.58	8.01
15/22	899	3.864	4	1.981	-	0.423	0.396	2.738	59-62	34.25	27.58	6.67
15/23	900	3.891	4	1.208	1.717	0.244	0.239	1.985	63-67	32.38	27.58	4.8
15/31	908	5.715	2.25	2.02*	-	0.523	0.482	4.28*	68-69	62.72	44.48	18.24
15/32	909	5.701	2.25	1.496	-	0.540	0.488	2.893	70-73	58.67	44.48	14.19

Table 6

RESULTS FOR ROUND BILGE MODEL WITH SPRAY REVERSERS (CONFIGURATION 2) IN SEA STATE 3

Run No	AEW Star Run No	Model Speed (m/s)	Trim Flap Angle (Degs)	Rms					Figure No	Mean Resistance (Newtons)	Deduced	
				Pitch (Degs)	Heave (CM)	CG Accel (G)	Bow Accel (G)	Wave (CM)			Calm Resistance (N)	Resistance Increase (N)
17/2	924	1.798	22	1.819	1.557	0.103	0.243	1.863	74-78	18.82	18.68	0.14
17/3	925	1.787	22	3.152*	2.324*	0.105	0.251	2.46*	79-80	19.57	18.68	0.89
17/6	928	3.837	11	1.003	1.608	0.180	0.326	1.655	81-85	32.47	26.24	6.23
17/7	929	3.842	11	1.122	1.714	0.194	0.341	1.723	86-90	32.92	26.24	6.68
17/8	930	3.842	11	1.060	1.676	0.186	0.339	1.663	91-95	32.47	26.24	6.23
17/9	931	3.847	11	1.033	1.661	0.186	0.313	1.746	96-100	33.81	26.24	7.57
17/13	935	5.805	3.5	0.786	1.886	0.262	0.406	1.671	101-105	48.93	37.36	11.57
17/14	936	5.811	3.5	1.289	2.023	0.279	0.466	1.927	106-110	49.37	37.36	12.01
17/15	937	5.807	3.5	0.886	2.094	0.26	0.405	2.02*	111-114	48.93	37.36	11.57

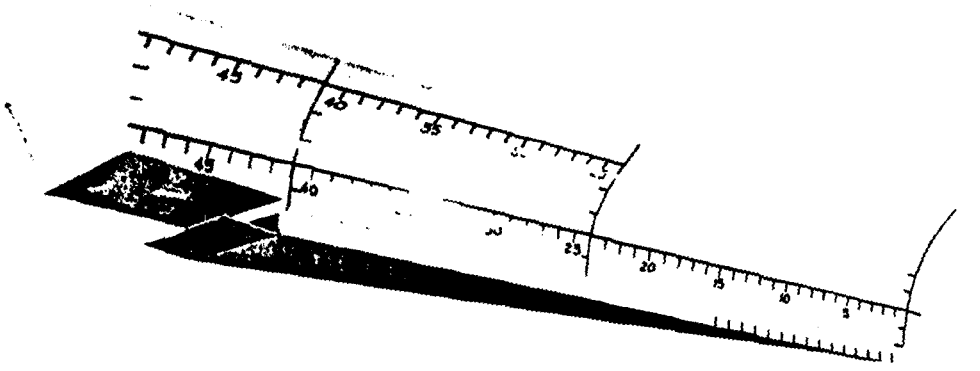


Figure 1

SEA KNIFE MODEL CONFIGURATION 1

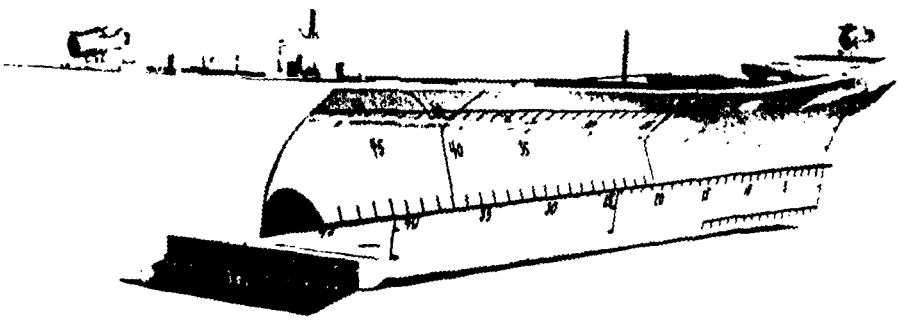


Figure 2

SEA KNIFE MODEL CONFIGURATION 2